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Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

James McKeith

For: COMMAND LINE OUTPUT REDIRECTION

Enclosed are:

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4 sheets of drawings.

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Multiple Dependent Claims (check if applicable)	<input type="checkbox"/>				\$0.00
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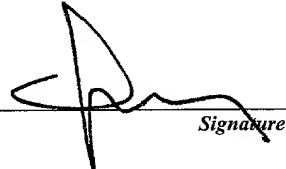
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Dated: November 24, 1999


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MICE-0089-US

(99.03185)

APPLICATION
FOR
UNITED STATES LETTERS PATENT

TITLE: COMMAND LINE OUTPUT REDIRECTION
INVENTOR: James McKeeth

Express Mail No: **EL51508886US**

Date: **November 24, 1999**

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COMMAND LINE OUTPUT REDIRECTION

Background

The invention relates generally to computer system support of application program execution and, more particularly but not by way of limitation, to a method and apparatus for redirecting command line utility output to a non-application maintained storage location.

Many applications such as word processing and file viewing programs have occasion to access system information. Often, such system information is available only through command line (e.g., console) utilities. That is, utilities that are accessible only through a command line interface. Illustrative command line utilities include "dir" and "net view" commands available in the Microsoft WINDOWS® operating system and the "w" command available in UNIX® and UNIX®-like operating systems (provides a list of users logged onto a specified computer system).

One difficulty with command line utilities is that their output is not generally directly useable by an executing application. The conventional technique by which a user application obtains command line utility output is shown in FIG. 1. After a temporary text file is created (block 100), the command line utility whose output is desired is invoked via a standard interface (block 102). Output from the command line utility is piped to the temporary file (block 104), from which the application extracts and processes the desired data (block 106). Sound programming practice calls for the destruction/removal of the temporary file created in block 100 (block 108). It will be recognized that a temporary file may be created by the piping operation itself, i.e., during the acts of block 104. Nevertheless, the use of a temporary file is generally considered essential.

A problem with the technique of FIG. 1 is that the application invoking the command line utility may not have file creation privileges on the computer system. If this is so, then the application will be unable to obtain the desired

data. Another problem is that if the disk the application has access to is full (i.e., incapable of accepting new or enlarged user files), any attempt to create a new file will generate an error. Yet another problem is that the file name chosen for the temporary file may already be in use. Still another problem is that many new
5 PCs are disk-less and, thus, may not provide a mechanism through which user initiated (i.e., user invoked application) file input-output is possible. A further problem with prior art techniques such as that shown in FIG. 1 is that maintenance of temporary files is left to the calling application. If the application that creates a temporary file fails to remove it, a plethora of useless files may be
10 generated over time.

Thus, it would be beneficial to provide a mechanism by which an application program may obtain output from a command line utility without the need to create a temporary file.

15 Summary

In one embodiment the invention provides a method to provide command line utility output to an application without the need of temporary files. The method includes receiving an identifier, receiving output from a command line utility, and storing the command line utility output in a system storage at a
20 location identified by the identifier. In one illustrative embodiment, command line utility output is stored in a system registry database, which is stored in active memory (temporary storage) when the system is active and stored in a file (permanent storage) when the system is inactive. In another illustrative embodiment, command line utility output is stored in a shared system memory.
25 The method may be stored in any media that is readable and executable by a computer system.

Brief Description of the Drawings

Figure 1 shows a prior art technique by which an application obtains
30 command line utility output.

Figure 2 shows, in flowchart form, the operation of a redirection utility in accordance with one embodiment of the invention.

Figure 3 shows, in flowchart form, the operation of a one specific redirection utility in accordance with FIG. 2.

5 Figures 4 shows a block diagram of a computer system incorporating a redirection routine in accordance with FIG. 2.

Detailed Description

Referring to FIG. 2, redirection routine **200** in accordance with one 10 embodiment of the invention uses a user/application specified identifier (block **202**) to identify command line utility output (block **204**) which it stores in a system-wide storage location (block **206**). By system-wide, it is meant that the storage location is available to all user applications and is, furthermore, 15 maintained by operation of the underlying operating system. Following the act of storage in block **206**, a value associated with the identifier in the system storage is updated to indicate completion of the redirection routine and to, possibly, 20 provide additional information to the calling application such as the amount (e.g., number of lines) of information stored. Once redirection routine **200** completes the act of storing in block **206**, the application invoking routine **200** may use the specified identifier to access the stored command line utility output.

One benefit of a redirection routine in accordance with FIG. 2 is that the calling application does not need file creation authority -- no temporary files are created. Another benefit is that there is no need for the calling application to remove temporary files as in prior art techniques such as that illustrated in FIG.

25 1. A corollary of this benefit is that the calling application does not require file deletion authorization. Yet another benefit of a redirection routine in accordance with the invention is that a second application cannot inadvertently destroy the results generated by a first application by accidentally replacing or deleting a temporary file (e.g., a background process designed to remove temporary files).

30 Still another benefit of the invention is that the application invoking redirection

routine **200** does not have to have disk I/O (input-output) authority as the storage location is maintained by the underlying operating system -- the application makes I/O calls to the specified storage location through standard system calls (see discussion below).

5 By way of example, consider a situation in which an executing application needs information of the type provided by command line utility CMD-UTIL, where CMD-UTIL represents any utility executable from a command line prompt (e.g., the "dir" directory command of a Microsoft WINDOWS® operating system or the "head" command of a UNIX® operating system). In accordance with the
10 invention, the application invokes a system call of the form:

CMD-UTIL [PARAM] | REDIRECT ID

15 Here, [PARAM] represents zero or more parameters that control or modify the execution of the CMD-UTIL utility, the "|" symbol represents the piping function available in many operating systems such as WINDOWS®, UNIX® and derivatives thereof, REDIRECT is the name of routine **200**, and ID is one or more parameters which REDIRECT routine **200** associates with output from CMD-UTIL during the act of storage in block **206** of FIG. 2.

20 It will be recognized that the calling application will generally ensure that the identifier it passes to routine **200** has either not been used or may be reused. It will further be recognized that command utilities may be stacked. That is, output from a first command utility (CMD-UTIL-1, for example) may be piped to a second, third, or Nth command utility (CMD-UTIL-N, for example) which
25 may then be piped to routine **200**. In this case, a system call in accordance with the invention would be:

CMD-UTIL-1 [PARAM] | . . . | CMD-UTIL-N [PARAM] | REDIRECT ID,

where "... represent one or more commands of the form CMD-UTIL-X
[PARAM].

Because many current personal computer systems (PCs) are operated or controlled by one version or another of the Microsoft WINDOWS® operating system, an illustrative embodiment of redirection routine **200** utilizing the WINDOWS® system registry (hereinafter, the registry) will now be given. It will be recognized that the registry is an operating system generated and maintained database which application programs, application setup programs, and the operating system itself use to store configuration information.

Information stored in the registry is organized into hierarchical keys and associated key entries. Current versions of the registry use six predefined root keys (AKA Hives): HKEY_USERS; HKEY.CLASSES.ROOT; HKEY.CURRENT.USER; HKEY.CURRENT.CONFIG; HKEY_LOCAL.MACHINE; and HKEY.DYN.DATA. Each key in the registry can have one or more sub-key entries. Each key and sub-key can have one or more names (a unique character string identifier) and each name can have an associated value (data stored in a defined manor, may be a character string, binary data, a number, a Boolean value, etc.). Each key and sub-key has one default key entry that has no name.

Access to the registry is provided through system calls defined in the registry application programming interface (API). Illustrative registry API functions include: RegEnumKeyEx, which enumerates the sub-keys of a specified key; RegOpenKeyEx, which opens and returns a handle to a specified key; RegEnumValue, which enumerates the key entries associated with a specified key; RegQueryValueEx, which returns the assigned value of a specified key entry; RegSetValueEx, which assigns a value to a specified key entry, creating the key entry if the key entry was not previously registered; RegDeleteKey, which removes a key from the registry; and RegDeleteValue, which removes a key entry from the registry. Using keys (hereinafter understood to include sub-keys) and registry API system calls, routine **200** can store command line utility

output in the registry file. Using the same keys, an application program can retrieve information previously stored by routine **200**.

Referring now to FIG. 3, in one embodiment WINDOWS® based redirection routine **300** receives an identifier comprising a key from a calling application (block **302**). An illustrative key is HKEY.DYN.DATA/CMD-UTIL-OUTPUT-KEY. Routine **300** then begins receiving output from the CMD-UTIL utility, generally one line at a time as most command line utilities generate output targeted for line oriented standard output devices such as a computer display (block **304**). The received line is stored in the registry at a key name that uniquely identifies the line (block **306**). For example, each received line of output may be stored in the registry key:

HKEY. DYN. DATA/CMD-UTIL-OUTPUT-KEY,

15 with a name of "N," where "N" is set equal to 1 for the first received line, 2 for the second received line, and so forth. A test is then made to determine if additional command line utility output is available for storage (diamond **308**). If another line of output is available (the "yes" prong of diamond **308**), processing continues as block **304**. If no more output is available (the "no" prong of diamond **308**), the default value of the received key (i.e., HKEY_DYN_DATA/CMD-UTIL-OUTPUT-KEY) is set equal to a value corresponding to the total number of lines received and stored by routine **300** (block **310**). On completion, output from the command line utility CMD-UTIL is available for retrieval and manipulation by the calling application without the need to create, 20 maintain or delete a temporary file.

25 In another embodiment, the ID parameter includes a storage location identifier. One value of the storage location identifier may direct use of the registry (or a similar operating system maintained database) while another value of the storage location identifier may direct use of operating system shared memory (e.g., volatile random access memory). One example of operating

system shared memory is the "clipboard" memory maintained by the WINDOWS® operating system.

Referring now to FIG. 4, illustrative computer system **400** in accordance with one embodiment of the invention includes redirection routine **400** (e.g., a 5 routine in accordance with **200** and/or **300**) to redirect output from a command line utility to a specified operating system controlled memory location. As shown, routine **400** may be retained in storage device **404** which is coupled to processor **406** via system bus **408**. It will be understood that storage device **404** may represent non-volatile memory devices or a combination of volatile and 10 non-volatile memory devices. Illustrative non-volatile storage devices include, but not limited to: semiconductor memory devices such as EPROM, EEPROM, and flash devices; magnetic disks (fixed, floppy, and removable); other magnetic media such as tape; and optical media such as CD-ROM disks. It will be further recognized that computer system **400** may incorporate one or more input-output 15 devices **410** such as one or more secondary bus bridge circuits, memory controllers, accelerated graphics port devices and network interface adapters.

Various changes in the details of the illustrated operational methods as well as in the components of computer system **400** are possible without departing from the scope of the following claims. For instance, instructions to 20 perform the acts of FIGS. 2 and 3 may be embodied in a program module implemented as, for example, a dynamic link library available through a standard interface. In addition, the illustrative system of FIG. 4 may include additional components such as network interface adapters and the like.

Thus, while the invention has been disclosed with respect to a limited 25 number of embodiments, numerous modifications and variations will be appreciated by those skilled in the art. It is intended, therefore, that the following claims cover all such modifications and variations that may fall within the true spirit and scope of the invention.

What is claimed is:

- 1 1. A method to provide process command line utility output, comprising:
 - 2 receiving an identifier;
 - 3 receiving output from a command line utility; and
 - 4 storing the command line utility output in a system storage at a location
 - 5 identified by the identifier.
- 1 2. The method of claim 1, wherein the act of receiving an identifier
2 comprises receiving an identifier that identifies one or more entries in a system
3 registry database.
- 1 3. The method of claim 2, wherein the act of receiving an identifier
2 comprises receiving a root key identifier.
- 1 4. The method of claim 3, wherein the act of receiving a root key identifier
2 further comprises receiving a sub-key identifier.
- 1 5. The method of claim 2, wherein the system registry comprises a
2 WINDOWS operating system registry database.
- 1 6. The method of claim 1, wherein the act of receiving an identifier further
2 comprises receiving a system storage identifier.

1 7. The method of claim 6, wherein the act of receiving a system storage
2 identifier comprises receiving an identifier indicating a system registry.

1 8. The method of claim 6, wherein the act of receiving a system storage
2 identifier comprises receiving an identifier indicating shared system memory.

1 9. The method of claim 8, wherein the act of receiving an identifier indicating
2 shared system memory identifies a system clipboard memory.

1 10. The method of claim 1, wherein the act of receiving output from a
2 command line utility comprises receiving output directly from the command line
3 output utility.

1 11. The method of claim 1, wherein the act of receiving output from a
2 command line utility comprises receiving output from the command line output
3 utility through a subsequent command line output routine.

1 12. The method of claim 1, wherein the act of storing comprises associating
2 each line of command line utility output with a line identifier in the system
3 storage.

1 13. The method of claim 12, further comprising setting each line identifier to a
2 value corresponding to that lines position in the command line utility output.

1 14. The method of claim 12, further comprising setting a default value of the
2 received identifier to equal the total number of command utility output lines
3 stored in the system storage.

1 15. A program storage device, readable by a computer, comprising
2 instructions stored on the program storage device for causing the computer to:
3 receive an identifier;
4 receive output from a command line utility; and
5 store the command line utility output in system storage at a location
6 identified by the identifier.

1 16. The program storage device of claim 15 wherein the instructions to store
2 comprise instructions to store command line utility output in an operating system
3 registry database.

1 17. The program storage device of claim 15 wherein the instructions to store
2 comprise instructions to store command line utility output in an operating system
3 maintained volatile memory.

1 18. The program storage device of claim 15 wherein the instructions to
2 receive output comprise instructions to receive one or more lines of output from
3 the command line utility, and the instructions to store further comprise
4 instructions to store each of said one or more lines of output in the system
5 storage.

1 19. The program storage device of claim 18 wherein the instructions to store
2 further comprise instructions to associate a unique identifier with each of the one
3 or more lines of output stored in the system storage.

1 20. The program storage device of claim 18 wherein the instructions to store
2 further comprise instructions to set a value associated with the received identifier
3 in the system storage equal to the number of lines of output stored in the
4 system storage.

1 21. A computer system, comprising:
2 a processor; and
3 a storage device coupled to the processor, the storage device having
4 stored thereon a program having instructions to receive an identifier, receive
5 output from a command line utility, and store the command line utility output in
6 system storage at a location identified by the identifier.

1 22. The computer system of claim 21, wherein the program comprises a
2 dynamic link library.

COMMAND LINE OUTPUT REDIRECTION

Abstract

In one embodiment the invention provides a method to provide command line utility output to an application without the need of temporary files. The

5 method includes receiving an identifier, receiving output from a command line utility, and storing the command line utility output in a system storage at a location identified by the identifier. In one illustrative embodiment, command line utility output is stored in a system registry database. In another illustrative embodiment, command line utility output is stored in a shared system memory.

10 The method may be stored in any media that is readable and executable by a computer system.

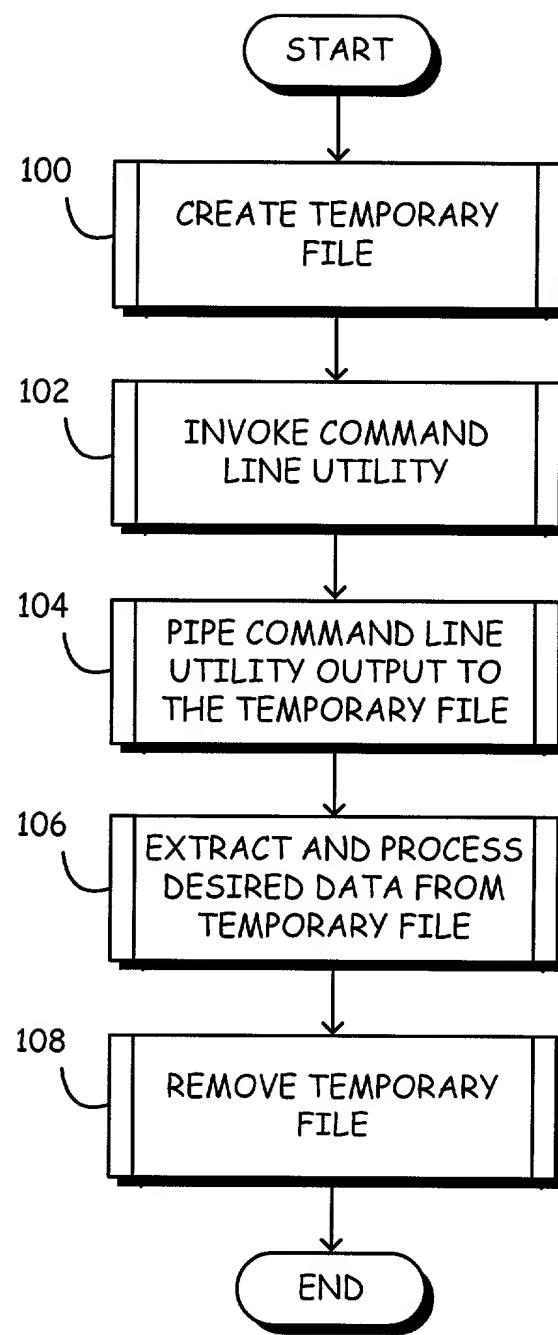


FIG. 1
(Prior Art)

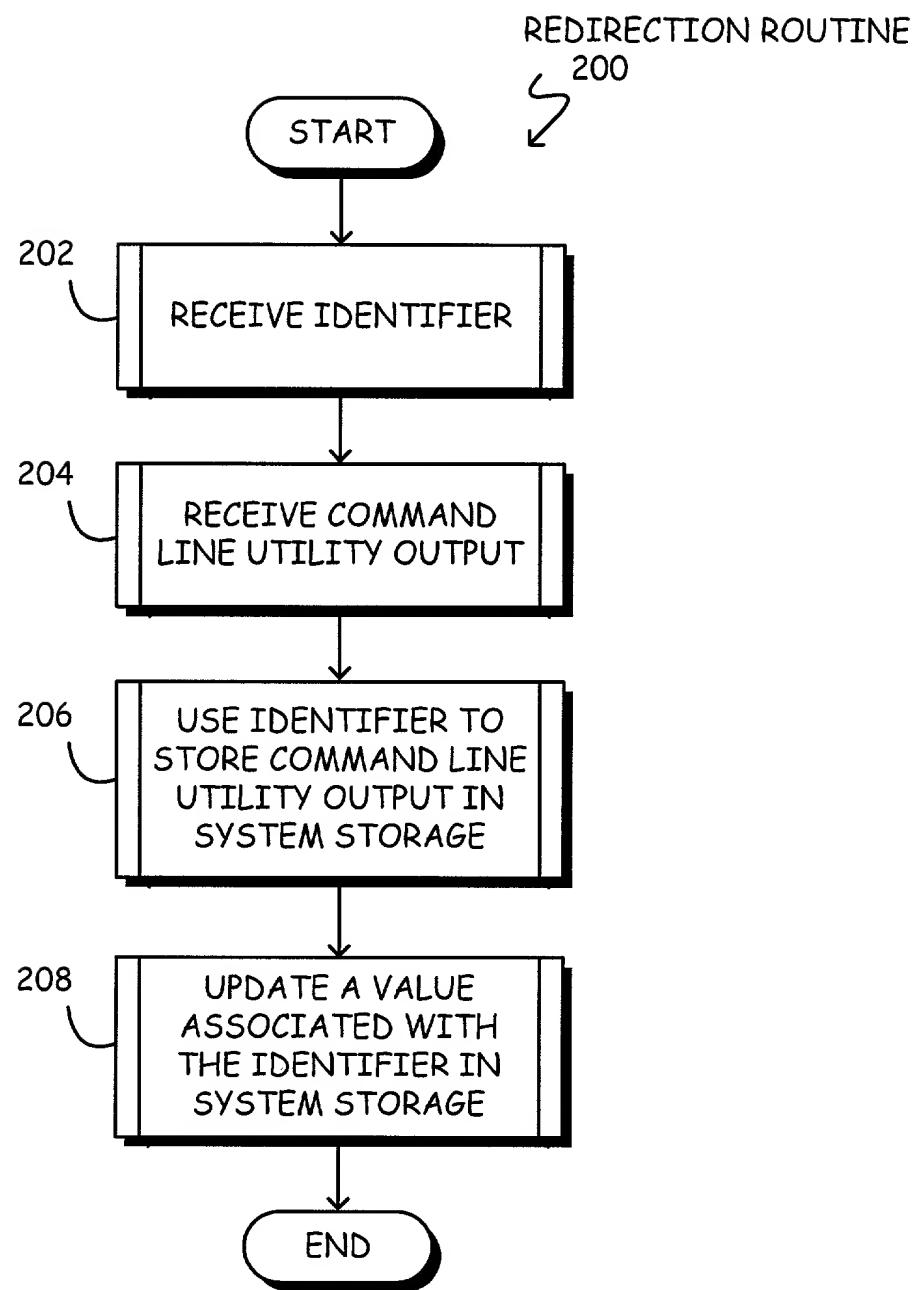


FIG. 2

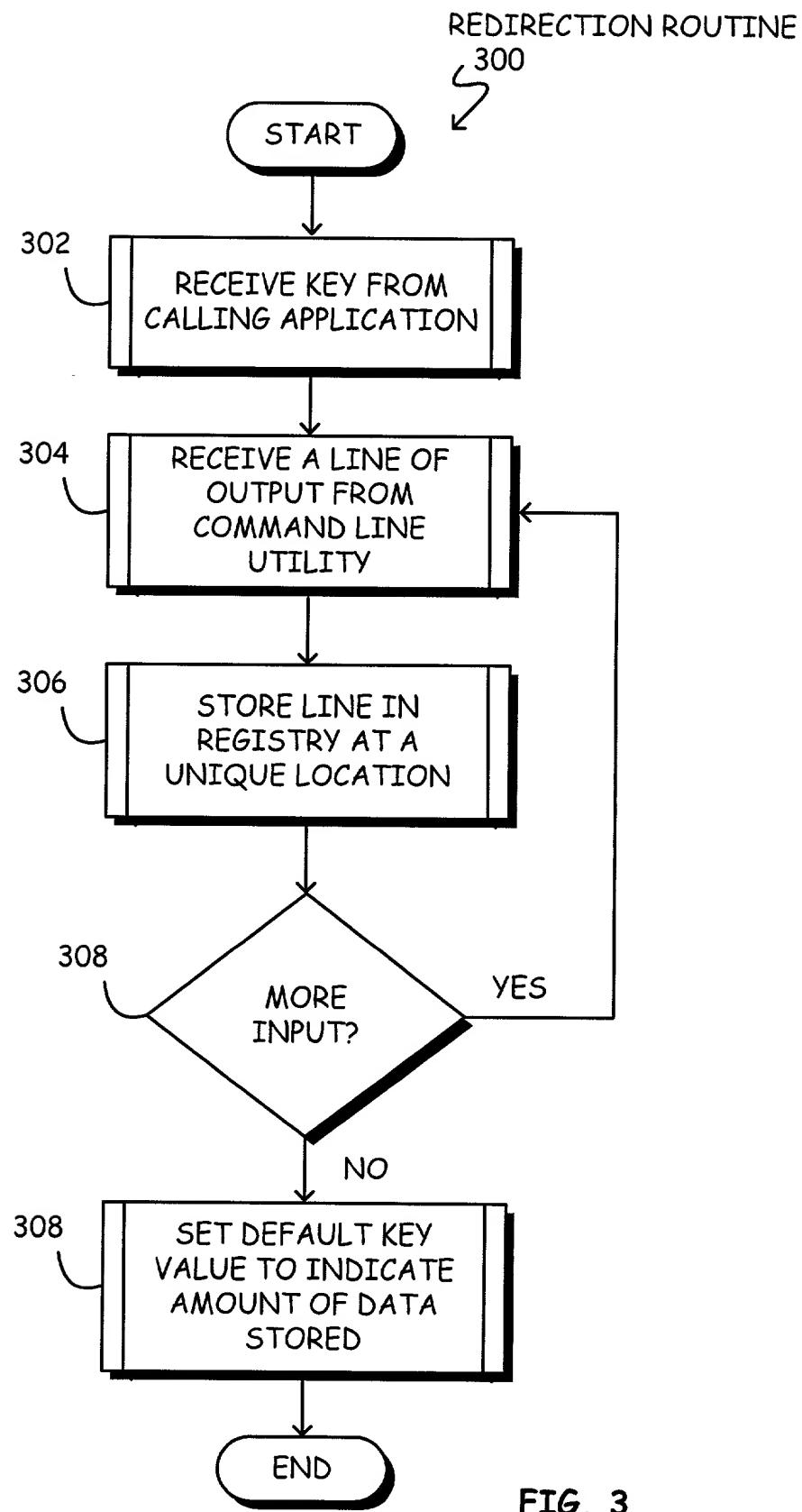


FIG. 3

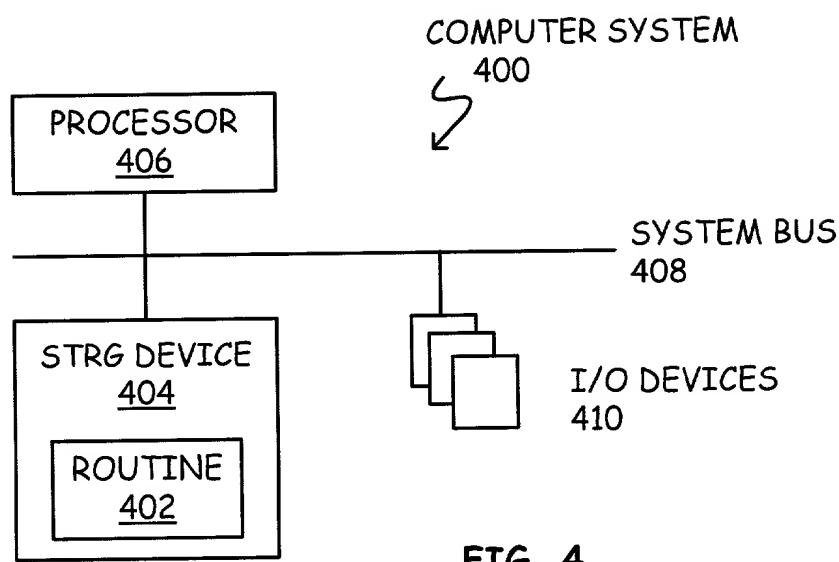


FIG. 4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor : James McKeeth
Title : Command Line Output Redirection
Serial No. : Unknown Docket : MICE-0089-US
Filed : Herewith (99.03185)

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CERTIFICATE OF MAILING (37 C.F.R. 1.10)
The undersigned hereby certifies that this correspondence is being deposited with the U.S. Postal Service as Express Mail in an envelope addressed to the Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231, Express mail label number **EL51508886US** on November 24, 1999.


Be Henry

DECLARATION

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor of the subject matter which is claimed and for which a patent is sought on the above identified invention, the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above-identified application, including the claims.

I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Send correspondence to Coe F. Miles of TROP, PRUNER, HU & MILES, P.C., 8554 Katy Freeway, Suite 100, Houston, TX 77024 and direct telephone calls to Coe F. Miles at (713) 468-8880.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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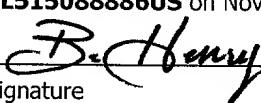
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor : James McKeeth
Title : Command Line Output Redirection
Serial No. : Unknown Docket : MICE-0089-US
Filed : Herewith (99.03185)

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CERTIFICATE OF MAILING (37 C.F.R. 1.10)

The undersigned hereby certifies that this correspondence is being deposited with the U.S. Postal Service as Express Mail in an envelope addressed to the Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231, Express mail label number **EL515088886US** on November 24, 1999.


Signature

ELECTION OF POWER OF ATTORNEY

The undersigned, being Assignee of the entire interest in the above-identified application by virtue of an Assignment filed herewith, hereby elects under 37 C.F.R. § 3.71 to prosecute the application to the exclusion of the inventor.

The Assignee hereby revokes any previous Powers of Attorney and appoints: Coe F. Miles, Reg. No. 38,559; Timothy N. Trop, Reg. No. 28,994; Fred G. Pruner, Jr., Reg. No. 40,779; Dan C. Hu, Reg. No. 40,025, and John R. Merkling, Reg. No. 31,716 my patent attorneys, of TROP, PRUNER, HU & MILES, P.C., with offices located at 8554 Katy Freeway, Suite 100, Houston, TX 77024, telephone (713) 468-8880; and Hoyt A Fleming, III, Reg. No. 41,752, Paul A. Revis, Reg. No. 45,040, and Steven P. Arnold, Reg. No. 33,354 my patent attorneys, of MICRON ELECTRONICS, INC. with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to transact all business in the Patent and Trademark Office connected therewith, to receive any Letters Patent, and for one year after issuance of such Letters Patent to file any request for a certificate of correction that may be deemed appropriate.

Pursuant to 37 C.F.R. § 3.73, the undersigned duly authorized designee of Assignee certifies that the evidentiary documents have been reviewed, specifically the Assignment to MICRON ELECTRONICS, INC., referenced below,

and certifies that to the best of my knowledge and belief, title remains in the name of the Assignee.

Send correspondence to Coe F. Miles of TROP, PRUNER, HU & MILES, P.C., 8554 Katy Freeway, Suite 100, Houston, TX 77024 and direct telephone calls to Coe F. Miles at (713) 468-8880.



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